A

PROPOSAL

About Printing a TREATISE of

ALGEBRA,

HISTORICAL and PRACTICAL:

Written by the Reverend and Learned Dr. John Wallis (*Savilian Profeſſor of* Geometry *in the Univerſity of* Oxford), *containing not only a Hiſtory, but an Inſtitution of* ALGEBRA, *according to ſeveral Methods hitherto in practice; with many Additions of his own.*

IT contains an Account of the Original, Progreſs, and Advancement of (what we now call) *Algebra*, from time to time, and by what ſteps it hath attained to that height at which now it is.

Aſſerting, That it was in uſe of old among the *Grecians*; but ſtudiouſly concealed as a great Secret.

Examples we have of it in *Euclid*, at leſt in *Theon*, upon him; who aſcribes the invention of it (amongſt them) to *Plato*.

Other Examples we have of it in *Pappus*, and the effects of it in *Archimedes*, *Apollonius*, and others, though obſcurely covered and diſguiſed.

But we have no profeſſed Treatiſe of it (among them) ancienter than that of *Diophantus*, firſt publiſhed (in *Latin*) by *Xylander*, and ſince (in *Greek* and *Latin*) by *Bachetus*, with divers Additions of his own; and reprinted lately with Additions of Monſieur *Fermat*.

That it was of ancient uſe among the *Arabs* (and perhaps ſooner than amongſt the *Greeks*), which they are ſuppoſed to have received from the *Perſians*, and theſe from the *Indians*.

From the *Arabs* (by means of the *Saracens* and *Moors*) it was brought into *Spain*, and thence into *England* (together with the uſe of the Numeral Figures, and other Parts of *Mathematical* Learning, and particularly the *Aſtronomical*), before *Diophantus* ſeems to have been known amongſt us. And from thoſe we have the name of *Algebra*.

And indeed moſt of the *Greek* Learning came to us the ſame way, the firſt Tranſlations of *Euclid*, *Ptolomy*, and others, into *Latin*, being from the *Arabic* Copies, and not from the *Greek* Originals.

That the uſe of the *Numeral* Figures (which the *Greeks* had not) was a great advantage to the improvement of *Algebra*.

Theſe Figures ſeem to have come in uſe in theſe Parts about the middle of the Eleventh Century (about the year 1050), though ſome others think not 'till about 200 years after, and it ſeems they did ſcarce come to be of common uſe 'till about that time.

The *Sexageſimal* Fractions (introduced it ſeems by *Ptolomy*) did but imperfectly ſupply the want of ſuch a Method of Numeral Figures.

The uſe of Numeral Figures have received two great Improvements, The one is that of Decimal Parts, which ſeems to have been introduced (ſilently

and unobſerved) by *Regiomontanus*, in his Trigonometrical Canons, about the year 1450, but much advanced in the laſt and preſent Century, by *Simon Stevin* and Mr. *Briggs*, &c.

And this is much to be preferred before *Ptolomy*'s Sexageſimal way, as is ſhewed by the comparative uſe of both.

The other Improvement is that of *Logarithms*, which is of great uſe in *Aſtronomical* and other *Trigonometrical* Calculations, introduced by the Lord *Neper*, and perfected by Mr. *Briggs* (about the beginning of this Century). The ground and practice of which is here declared.

And theſe things, though they be not properly Parts of *Algebra*, are yet of great advantage in the practiſe of it.

The firſt printed Author which treats of *Algebra* is *Lucas Pacciolus*, or *Lucas de Burgo* a Minorite Fryer, of whom we have a Treatiſe in *Italian*, printed at *Venice* in the year 1494, (ſoon after the firſt Invention of Printing.)

But he therein mentions *Leonardus Piſanus*, and divers others more ancient than himſelf, from whom he learned it, but whoſe Works are not now extant.

This Fryar *Lucas*, in his *Summa Arithmetica & Geometrica*, (for he hath other Works extant) hath a very full Treatiſe of *Arithmetic* in all the Parts of it; in *Integers*, *Fractions*, *Surds*, *Binomials*; Extraction of *Roots*, *Quadratic*, *Cubic*, &c. and the ſeveral Rules of *Proportion*, *Fellowſhip*, about *Accompts*, *Alligation*, *Falſe Poſition*; and of *Algebra*, with the Appurtenances thereunto, as far as *Quadratic Equations* reach, but no farther: And this he tells us was derived from the *Arabs*, (to whom we are beholding for this kind of Learning,) without taking notice of *Diophantus* (or other *Greek* Authors), who it ſeems was not known here in thoſe days.

After him followed *Stiphelius* (a good Author), and others by him cited, who alſo proceed no farther than *Quadratic* Equations.

Afterwards *Scipio Ferreus*, *Cardan*, *Tartalea*, and others, proceeded to the Solution of (ſome) *Cubic* Equations.

And *Bombelli* goes yet farther, and ſhews how to reduce a *Biquadratic* Equation (by the help of a *Cubic*) to two *Quadratics*.

And *Nonnius* (or *Nunnez*, in *Spaniſh*) *Ramus*, *Schonerus*, *Salignacus*, *Clavius*, and others, (in the laſt Century) purſued the ſame Subject, in different ways; but (for the moſt part) proceed no farther than *Quadratic* Equations.

In the mean time, *Diophantus*, firſt by *Xylander* (in *Latin*), and afterwards by *Bachetus* was made public, whoſe Method differs much from that of the *Arabs* (whom thoſe others followed), and particularly in the order of denominating the Powers; as taking no notice of *Surſolids*, but uſing only the names of *Square* and *Cube*, with the Compounds of theſe.

And hitherto no other than the unknown Quantities were wont to be denoted in *Algebra* by particular Notes or Symbols, but the known Quantities by the ordinary Numeral Figures.

The next great ſtep, for the improvement of *Algebra*, was that of *Specious Arithmetic*, firſt introduced by *Vieta* about the year 1590.

The *Specious Arithmetic*, which gives Notes or *Symbols* (which he calls *Species*) to Quantities both known and unknown, furniſheth us with a ſhort and convenient way of Notation; whereby the whole proceſs of many Operations is at once expoſed to the Eye in a ſhort Synopſis.

By help of this he makes many Diſcoveries, in the proceſs of *Algebra*, not before taken notice of.

And he introduceth his Numeral *Exegeſis*, of affected Equations, extracting the Roots of theſe in Numbers. Which had before been applied to ſingle Equations, ſuch as the extracting the Roots of *Squares*, *Cubes*, &c. ſingly propoſed; but had not been applied to Equations affected. And in the Denomination of Powers, he follows the order of *Diophantus*, not that derived from the *Arabs*, which others had before uſed.

The method of *Vieta* is followed and much improved by Mr. *Oughtred* in his *Clavis* (firſt publiſhed in the year 1631) and other Treatiſes of his; and it doth in a brief compendious method declare in ſhort what had before been the Subject of large Volumes.

And

And for this reaſon, here is a pretty full account of his Method inſerted, together with an Inſtitution for the practice of *Algebra* according thereunto; and though much of it had been before taught in the Authors above-mentioned, yet this was thought the moſt proper place to inſert ſuch an Inſtitution, becauſe by him delivered in the moſt compendious form.

And in purſuance of his Method, and as an Exemplification thereof, there is here inſerted a Diſcourſe of *Angular Sections*, and ſeveral things thereon depending.

Mr. *Harriot* was contemporary with Mr. *Oughtred*, but died before him, and left many good things behind him in writing, of which there is nothing hitherto made public, but only his *Algebra* or *Analytice*, which was publiſhed by Mr. *Warner* ſoon after that of Mr. *Oughtred*, in the ſame year 1631.

He alters the way of Notation, uſed by *Vieta* and *Oughtred*, for another more convenient.

And he hath alſo made a ſtrange improvement of *Algebra*, by diſcovering the true conſtruction of *Compound Equations*, and how they be raiſed by a Multiplication of *Simple Equations*, and may therefore be reſolved into ſuch.

By this means he ſhews the number of Roots (real or imaginary) in every Equation, and the Ingredients of all the Coefficients, in each degree of Affection.

He ſhews alſo how to increaſe or diminiſh the *Roots*, yet unknown by any Exceſs, or in any Proportion aſſigned; to deſtroy ſome of the intermediate Terms, to turn Negative Roots into Affirmative, or theſe into thoſe; with many other things very advantagious in the practice of *Algebra*.

In ſum, He hath taught (in a manner) all that which hath ſince paſſed for the *Carteſian* method of *Algebra*, there being ſcarce any thing of (pure) *Algebra* in *Des Cartes*, which was not before in *Harriot*, from whom *Des Cartes* ſeems to have taken what he hath, that is purely *Algebra*, but without naming him.

But the Application thereof to *Geometry*, or other particular Subjects, is not the buſineſs of that Treatiſe, (but what he hath handled in other Writings of his, which have not yet the good hap to be made public;) the deſign of this being purely *Algebra*, abſtract for particular Subjects.

Of this Treatiſe here is the fuller account inſerted, becauſe the Book it ſelf hath been but little known abroad; that it may hence appear to what eſtate *Harriot* had brought *Algebra* before his death.

After this follows an account of Dr. *Pell*'s Method, who hath a particular way of Notation, by keeping a Regiſter (in the Margin) of the ſeveral ſteps in his Demonſtrations, with References from one to another.

Of this, ſome Examples are here inſerted of his own, and others in imitation thereof; with intimation how that innumerable Solutions of undetermined Caſes are by his method eaſily diſcoverable, where great Mathematicians have thought it a great work to find out ſome one.

On this occaſion there is a farther Diſcourſe of *Undetermined Queſtions*, and the Limitation of them, and particularly of the Rule of *Alligation*, and of (what they call) *Geometrical Places*, which are of a like nature, and but the *Geometrical* Conſtruction of (ſome of) theſe Undetermined Queſtions.

After this is a Diſcourſe of *Negative Squares*, and the Roots of them, on which depend (what they call) *imaginary Roots* of impoſſible Equations, ſhewing what is the true Import thereof in nature, with divers Geometrical Conſtructions ſuiting thereunto.

Then follows a Diſcourſe of the Method of *Exhauſtions* (uſed by Ancients and Moderns), with the foundation of it.

And in purſuance thereof, the *Geometrica Indiviſibilium* of *Cavalerius*, ſhewing the true import thereof, and its agreement with the Ancients Method of Exhauſtions, as being but a compendious Expreſſion thereof, and grounded thereupon.

Conſequent to this, is the *Arithmetica Infinitorum*, which depends alſo on the method of Exhauſtions; taking that to be equal, which is proved to differ by leſs than any aſſignable Quantity.

And laſtly, the method of infinite *Series*, or continual *Approximations*, (grounded on the ſame Principles) ariſing principally from *Diviſions* and Extraction of *Roots*, in *Species*, infinitely continued; invented by Mr. *Iſaac Newton*, and purſued by

by Mr. *Nicholas Mercator*, and others, which is of great use for the rectifying of *Curve Lines*, squaring of *Curve-lined Figures*, and other abstruse Difficulties in *Geometry*.

Several other Discourses are in several places inserted; as, Of *Aliquote Parts*, and other Questions depending thereon; and divers other particulars, which will be seen in the Work it self.

The whole being written in *English*, is submitted to the *Royal Society*, to be printed or otherwise disposed of as they please; and if printed, will contain (as is supposed) about three or four Quires of Paper.

PROPOSAL.

THE Council of the *Royal Society* have approved this Treatise, and to encourage the Bookseller to print it, have agreed to give Security to take off 60 Books in Quires as soon as printed at Three Half-pence each Sheet, and as much each print of a Plate of Schemes; and seeing such a Subscription is not sufficient to incite an Undertaker, others that are desirous to promote this kind of Learning, (which contains the very Kernel of the *Mathematics* in it) are desired to encourage the Bookseller to proceed, by subscribing to take off a Book or more at the Rates aforesaid, paying or advancing towards each Book Five Shillings in hand.

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I Do Subscribe for Book after the Rate above-mention'd. Witness my Hand this day of 1683.